

SCOPE OF WORK
STANDBY GENERATOR AND ATS INSTALLATION
City of Ocala – Lift Station #9 & #22 Sites

1.1. DESCRIPTION

Provide two standby power-rated engine generator sets (U.S. made), one 200kW and one 20 kW. The generators shall be direct-coupled, liquid-cooled, with a conventional alternator and electronic governor. The unit shall be manufactured using parts readily available via next day/overnight shipping. The generator must be complete with system controls and all necessary accessories to make the generator set fully operational. Submittal of adequate size calculations, kW ratings, ATS, fuel volume requirements, tank capacity, and electrical components shall be determined by a qualified vendor, or an electrical engineer based on each lift station site location. Site visit required by a vendor representative. Preferred manufacture: Cummins or approved equal.

1.1.1 Provide for integral automatic and manual operation of the generator from a switch panel for all automatic transfer switches (ATS) for the generator locations as described in this specification. The system must come online automatically when utility power is not present at the ATS. The system must automatically transfer generator power to load, and on the restoration of utility power automatically re-transfers load to utility power. After utility power is restored at ATS, the system must shut down the generator and return it to a state of readiness for the next operating cycle. The switch panel must have provisions for manual operation to conduct routine preventative maintenance and diagnosis. Preferred manufacture: Asco or approved equal.

1.1.2 Standby and overload ratings shall meet the requirements herein.

1.1.3 The electric generating system must consist of an internal combustion engine, electrical generating alternator, electronic governor, couplings, and all controls, tested as a complete unit.

1.1.4 The generator must conform to NFPA 70 and applicable inspection authorities.

1.1.5 Transfer switch shall be labeled and approved to meet UL 1008.

1.1.6 The generator manufacture must manufacture the transfer switch to ensure a single source for repairs and technical support.

1.1.7 The generator manufacturer must provide a diagnostic communication link for engine and generator parameters.

1.1.8 The generator manufacturer must have a service location, parts inventory, and factory-trained technicians within a 2-hour response to the Ocala FL 34470 zip code.

1.3 SUMMARY OF EQUIPMENT

1.3.1 Standby Power Rated Engine Generator, 40kw or larger, 60HZ, 3-phase and neutral, (4 Wire).

1.3.2 Automatic Transfer Switch (ATS), 100A or larger.

1.1.9 The generator enclosure shall be sound-attenuated, weatherproof constructed of aluminum, and withstand 180 mph wind loads.

2.0 ENGINE-GENERATOR SET

The prime mover or engine of the generator shall be a liquid-cooled, diesel or natural gas-fueled, naturally aspirated engine of 4-cycle design, with four cylinders (minimum).

2.0.2 The engine shall be cooled with an integral, unit-mounted radiator, fan, water pump, and closed coolant recovery system, which provides visual diagnostic means to determine if the system is operating with a normal engine coolant level. The radiator shall be designed for satisfactory operation in 122 Degrees Fahrenheit (50 degrees Celsius) ambient temperature.

2.0.3 The intake air filter (with replaceable elements) shall be mounted on the unit. Full pressure lubrication shall be supplied by a positive displacement lube-oil pump system. The engine shall have a replaceable oil filter with internal bypass and replaceable elements. Engine coolant and oil drain extension must be provided outside the mounting base for maintenance servicing. A fan blade guard shall be installed for safety.

2.0.4 The engine shall have a battery charging DC alternator with an electronic voltage regulator. The engine stater must be a solenoid shift electric starter.

2.0.5 Engine speed electronic governor shall have a frequency control adjustable to maintain alternator frequency within five percent (across the range) from no load to full load.

2.0.6 The engine fuel system shall be designed for operation using ultra-low sulfur diesel or natural gas. Diesel-fueled units must have a secondary fuel filter, water separator with glass bowl, manual fuel priming pump, and fuel shut-off solenoid.

2.0.7 Sensors shall be located on the engine for low oil pressure shutdown, high coolant temperature shutdown, low coolant level shutdown, over-speed shutdown, and over-crank shutdown.

2.0.8 The electric coolant heater shall be thermostatically controlled to automatically maintain the coolant within 5 degrees of the control temperature. The control temperature shall be the temperature recommended by the manufacturer to optimize the starting time.

2.2 ALTERNATOR

The alternator must be manufactured by the engine manufacturer with a multi-pole revolving field type, 3-phase, 60 HZ, 4 wire, with a brushless, static exciter. The generator shall be standby rated. The stator shall be directly connected to the engine flywheel. The generator alternator temp rise shall not exceed 105 Celsius. The alternator must be a 12 lead reconnectable with leads extended into the AC-connected panel. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker. The alternator load shall be 100% of the nameplate kW rating.

2.2.1 The solid-state voltage regulator shall control the output voltage by varying the exciter magnetic field to provide plus or minus 1% regulation during stable load conditions. The regulator shall have a voltage droop characteristic of 4 volts per cycle to maximize motor starting capability in the event an extremely heavy load drops the output frequency. The frequency at which this droop operation begins shall be adjustable allowing the generator set to be properly matched to the load characteristics ensuring optimum system performance.

2.2.2 The voltage regulator shall contain a limiting circuit to prevent output voltage surges in excess of 110% of rated voltage during generator set operation. On a loss of the sensing signal, the voltage regulator shall shut down to prevent an overvoltage condition from occurring. A voltage regulator that can go into a full field condition is unacceptable. A visual indicator must be provided to monitor the sensing (yellow), excitation (green), and output circuit (red) of the voltage regulator.

2.2.3 The engine generator set, and fuel tank shall be mounted with vibration isolators, permitting suitable mounting to any level surface.

2.3 GENERATOR CONTROLS

2.3.1 All engine, alternator controls, and instrumentation shall be designed, built, wired, tested, and shock-mounted in a NEMA 3R enclosure to the engine-generator set by the manufacturer. It shall contain direct current (D.C.) panel lighting and a fused circuit for control protection.

2.3.2 The engine-generator set shall contain a complete engine start-stop control, which starts the engine on closing contacts and stops the engine on opening contacts. An automatic preheat circuit that can also be operated in a manual mode shall be provided. A cyclic cranking limiter shall be provided to open the starting circuit and disable the start cycle if the engine does not start after eight attempts. Engine control modules shall be the solid-state plug-in type for high reliability and easy service.

2.3.3 Safety shutdown monitoring system shall include solid-state engine monitor with individual lights and one common external alarm contact indicating the following conditions: Overcrank shutdown, Overspeed shutdown, High Coolant Temperature (Low Coolant Level shutdown), Low Oil Pressure shutdown, and fuel leak. The monitoring system shall include a lamp test switch for manual reset of tripped conditions. Engine RPM shall be monitored by an independent permanent magnetic sensor. The engine shall shut down immediately and provide a no RPM event and warning lamp in the event of a failure.

2.3.4 Engine instrumentation shall consist of an oil pressure gauge, coolant temperature gauge, D.C. amp gauge, and an engine run-hour-meter, located on the unit control panel. Alternator instrumentation shall include meters to indicate output voltage per phase, amperage per phase, and generator output frequency.

2.3.5 The generator must include a fuel gauge or low fuel level sensor.

2.3.6 A thermal-magnetic, UL listed, main-line, molded case circuit breaker shall be mounted in the generator terminal panel. Lineside connections shall be made at the factory.

2.3.7 A red emergency stop pushbutton shall be provided on the exterior of the enclosure and shall be accessible without the use of a key and without having to open the enclosure.

2.4 MISCELLANEOUS EQUIPMENT

The following miscellaneous equipment shall be provided as a part of this procurement action:

2.4.1 The transfer switch mechanism and controls shall be mounted in a NEMA 3R weatherproof enclosure, rated for outdoor installations.

2.4.1.1 The engine-generator set shall be factory enclosed in an aluminum enclosure.

2.4.1.2 The sound attenuating enclosure levels shall be no more than 95 decibels at 3 meters (maximum) when the unit is operated at full load. The enclosure shall have large, removable doors to allow complete access to the engine, alternator, and control panel. Each door shall be fitted with stainless steel, lockable hardware with two sets of identical keys. The enclosure shall meet local seismic requirements.

2.4.1.3 An automatic dual rate battery charger mounted inside the generator enclosure, in its own cabinet, shall be provided. The charger shall have 120-volt, single-phase input. The automatic charger system shall monitor and limit the charge current to maximum 10 amps. The output voltage shall not exceed 16 volts and must be protected against reverse polarity.

2.4.1.4 A heavy-duty, lead-acid battery set shall be provided by the generator set manufacturer with adequate voltage and amperage capacity to start and operate the engine. The battery shall be shipped in place fully charged with electrolyte with a warranty of 5 years.

2.4.1.5 An integral skid-type fuel tank for diesel applications shall be provided with the generator set to permit no less than 24 hours of operation at full rated load. The tank shall be sized for the largest integral skid type fuel tank available from the factory for this size generator. The fuel tank shall be a dual wall tank with a retention capacity of 110% of the internal tank. The integral fuel tank shall include an interstitial leak detector to provide notification of the presence of fuel in the interstitial space. The leak detector shall be able to be wired to the safety shutdown monitoring system and shall have a dedicated indicator light.

3.0 AUTOMATIC TRANSFER SWITCH (ATS)

3.0.1 The automatic transfer switch shall be furnished to maintain system compatibility and local service responsibility for the complete emergency power system. It shall be listed by Underwriter's Laboratory, Standard 1008, with circuit breaker protection afforded by the generator breaker. The Manufacturer's production data sample documents of the transfer switch tests shall withstand 10,000 mechanical operation cycles (minimum) without failure. Wiring shall comply with NEC table 373-6. The manufacturer shall furnish complete schematic and wiring diagrams for the particular automatic transfer switch and a typical wiring diagram for the entire system showing all components, relays, and part numbers. The ATS shall be secured to the stainless steel and weather-proof enclosure. All wiring and connections to integrate the ATS into the generator output shall be made by the vendor. The transfer switch must be manufactured by the engine generator manufacturer.

3.1 ATS RATINGS & PERFORMANCE

3.1.1 The automatic transfer switch (ATS) shall be a 4-pole design (3-pole + neutral), rated for full load, continuous operation. The ATS rating shall be ambient temperatures of -15 Degrees Celsius to +50 Degrees Celsius. The transfer switch shall have a minimum withstand and closing rating of 42,000 amperes. The RMS symmetrical fault current ratings shall be the rating listed in the UL listing or component recognition procedures for the transfer switch.

3.3 ATS CONSTRUCTION

3.3.1 The transfer switch shall be open transition type, positively electrically and mechanically interlocked in both normal and emergency positions. The transfer switch shall be approved for manual operation.

3.3.2 The transfer switch electrical actuator shall have an independent disconnect means to disable the electrical operation during manual switching. Maximum electrical transfer time in either direction shall be 160 milliseconds, exclusive of time delays. Main switch contacts shall be high-pressure silver alloy or superior contacts.

3.4 CONTROL EQUIPMENT

3.4.1 All control equipment shall be mounted on the inside of the cabinet door in a metal lockable enclosure with a transparent safety shield to protect all-solid-state circuit boards. This will allow for ease of service access when the main cabinet lockable door is open but prevent access by unauthorized personnel. Control boards shall have installed cover plates to avoid shock hazards while making control adjustments. The solid-state voltage sensors and time delay modules shall be plug-in circuit boards with corrosion-resistant contacts for ease of service and longevity.

3.4.2 A solid-state under-voltage sensor shall monitor each phase of the normal source and provide adjustable ranges for field adjustments for specific applications needs. Pick-up and drop-out settings shall be adjustable from a minimum of 70% to a maximum of 95% of nominal voltage.

3.4.3 The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred. Controls shall provide an automatic retransfer of the load from emergency to normal if the emergency source fails with the normal source available.

3.4.4 Provide a solid-state exercise clock to set the day and time of the generator to the exercise period. The clock shall have a seven-day, 24-hour programmable clock powered from the utility side of the transfer switch. A 150-hour internal battery shall be supplied to maintain the circuit board settings when the load side of the transfer switch is de-energized.

3.4.5 Minimum front-mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays, and AUTOMATIC mode to set the system for normal operation.

3.4.6 Provide unique colored indicator lamps to be energized when the transfer switch position is in either UTILITY, EMERGENCY, or STANDBY OPERATING mode. These lights shall be energized from the utility, or the engine-generator set.

3.4.7 Provide manual operating handle to allow for manual transfer. This handle shall be mounted inside the lockable enclosure so accessible only by authorized personnel.

3.4.8 Provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch will also be used for manual transfer switch operation.

3.4.9 Provide status lights to give a visual readout of the operating sequence. This shall include at a minimum: utility on, engine warm-up, standby voltage on, generator transfer, return to utility, and test mode.

4.0 FACTORY TESTING

4.0.1 Before shipment of the equipment, the engine-generator set shall be tested under rated load and power factor for performance and proper functioning of control and interfacing circuits. Tests shall include:

4.0.1.1 Verifying all safety shutdowns and components are functioning properly.

4.0.1.2 Single-step load pick-up per NFPA 110-1985, Paragraph 5-13.2.6.

4.0.1.3 Transient and voltage dip responses and steady-state voltage and speed (frequency) checks.

4.0.1.4 The factory test data sheet shall identify all tests (PASSED or FAILED) and accompany each generator set. This will be reviewed by the City of Ocala Fleet Management Department.

4.3 OWNERS MANUALS

4.3.1 One (1) hard copy set of owner's manuals specific to the generator and products supplied shall be furnished for each unit. General operating instruction, preventive maintenance, wiring diagrams, schematics, and parts exploded views specific to this model shall be included. A PDF version of the owner's manuals shall also be provided with each generator.

4.4 SUBMITTALS

4.4.1 Provide complete sets (for each rating of the generator) of Engineering Submittal for approval, showing all components, in addition to the engine, generator, and automatic transfer switch. Submittals shall include complete system interconnection wiring diagrams and manufacturer's warranty form indicating compliance with these specifications. Submittal of adequate size calculations, ATS, electrical components shall be determined by a qualified vendor, or an electrical engineer based on each lift station. Site visit required.

4.5 SPARE PARTS

General parts: Provide one set of maintenance (spare) parts for each generator provided under this submittal. Provide parts necessary to perform scheduled maintenance functions for 2000 operating hours plus replacement bulbs for indicators, replacement fuses for each fuse used on the generator and any other like items that the manufacturer deems necessary for routine maintenance. This group of parts shall include a complete list of all vendors recommended spares, including, but not limited to, the items listed below:

1. Engine lubricating oil filters and filter gaskets, if separate from the filter.
2. Fuel filters and filter gaskets, if separate from the filter.
3. Engine intake air filters and filter gaskets, if separate from the filter.
4. A minimum of 3 light bulbs of each type of light bulb used in the generator.
5. A minimum of 3 electrical fuses of each size/type fuse used in the generator.

4.6 WARRANTY

The vendor shall provide a five-year warranty on parts and labor, which starts from the date the equipment is commissioned on-site. This requirement shall not modify or change the standard contract warranty agreement.

5.0 INSTALLATION

5.1 The generator and ATS supplier shall visit the worksite to survey the required installation, then shall provide all materials and labor needed to install the generator and ATS. This shall include properly engineered concrete pads, conduit, cable, circuit breakers, and all equipment and materials. This shall also include interconnection of the ATS to utility power, and a 500A output circuit breaker panel in a NEMA 3R enclosure. Testing and commissioning shall be done by the contractor. Certified NFPA 110 test reports with a 4-hour load bank on-site shall be performed by the manufacturer's engine factory technician.